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10/691,944

10/23/2003

Lowell D. Bok

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85628

7590

05/13/2009

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EXAMINER

SMITH, FRANCIS P

ART UNIT

PAPER NUMBER

1792

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DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                   |  |
|------------------------------|--------------------------------------|-----------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/691,944 | <b>Applicant(s)</b><br>BOK ET AL. |  |
|                              | <b>Examiner</b><br>Francis P. Smith  | <b>Art Unit</b><br>1792           |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-11,13-23,25-29 and 42-46 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-11,13-23,25-29 and 42-46 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/9/2008;10/23/2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 22, 2009 has been entered.

### ***Response to Arguments***

2. Applicant's arguments filed April 22, 2009 have been fully considered but they are not persuasive. Applicants argue the combination of references relied on for obviating the instant application. Froberg teaches that continuous carbon infiltration processes were well known at the time of the invention. The Purdy reference was referenced to illustrate the well known usage of **multiple modules** in CVI densification processes (as per applicants' amendment). Regarding Golecki, applicants proclaim that "the reliance on Golecki is in error" and that the mechanism of Golecki cannot be easily extended into a continuous system. The examiner respectfully disagrees. Golecki teaches a rapid, one step process for vapor-phase densification of porous substrates. Furthermore, Golecki states that "the present process can also be made into a continuous process by straightforward extensions of the system." Applicant also argues that Golecki/Purdy's susceptor is different than the module of the instant invention.

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However, it is the examiner's position that Golecki/Purdy's susceptor, which holds the porous substrates, reads on a "module" as **currently claimed**, since the module characteristics are not currently specified. Therefore, it is the examiner's position that the combination of references would have reasonably suggested to one having ordinary skill in the art at the time of the invention to construe a continuous densification process utilizing multiple modules since the combined prior art teaches the elements of the instant application. Furthermore, regarding Applicants' piecemeal analysis of the cited references, it has been held that one cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references. The individual references themselves are not required to make a suggestion for the combination to be obvious. The test under 35 USC 103 is not what the reference expressly or individually teach, but what their combined teaching would fairly have suggested to a person skilled in the art.

### ***Drawings***

3. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because handwritten alphanumeric designations can be ambiguous.

Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 3-11, 13-20, 22, 23, 25-29, and 42-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Froberg (3,944,686) in view of Purdy et al. (2001/0019752) and Golecki et al. (US 5,348,774) as evidence.

Regarding claims 1, 4-6, 11, 14-16, 23, and 45 Froberg teaches a method for vapor depositing pyrolytic carbon on porous sheets of carbon material. Specifically, an elongated continuous porous sheet of fibrous carbon (i.e. porous material) is longitudinally traversed through a reduced pressure heating zone (i.e. continuously loading the porous material into a CVI chamber) while introducing a reactant gas onto the heated porous sheet (i.e. densification/infiltration) (see abstract; col. 2, line 65-68). The sheet moved through guide slot 38 with polycrystalline graphite plates 36 and 40 located above and below the guide slot, whereby the plates are capable of acting as an electrical resistance element for heating slot 38 (see fig. 1; col. 4, lines 1-10).

Regarding the limitation of placing said porous material into a module(s), it is

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very well known in the CVI art to place porous material into modules for densification processes (for example, see [0090], [0092], and figs. 17 and 18 of Purdy as evidence).

Purdy also discloses preheating a reactant gas (i.e. via pre-heater 458 of fig.

15)/introducing said reactant gas into said CVI chamber while heating a porous material in said module with a heater plate proximate said porous material, whereby said porous material in said module is densified [0062], [0068], and [0082]). Purdy teaches using multiple modules for densifying a large number of porous substrates (i.e. multiple individual modules) (see fig. 18; [0092]). Furthermore, Golecki teaches that such densification methods may be conducted in a one step (e.g. batch) process or may also made into a continuous process by straightforward extensions of the batch system. Therefore, Golecki teaches that both batch and continuous densification processes were known in the art at the time of the invention AND easily inter-changeable.

Claims 3 and 13, Froberg teaches removing the porous structures from the chamber after a heat treatment, which will inherently cool the porous material.

As per claims 7, 17, and 25, Froberg does not explicitly disclose a reverse gas flow process; however, once the reactant gas is introduced into the chamber, the gas will interact with the heating plates and will inherently have the same effect as the reverse flow rate of the second pre-heater of the instant application (col. 4, lines 1-10).

For claims 8, 9, 18, 19, 42, 43, Froberg discloses a reactant gas mixture comprising acetylene, natural gas, methane, etc (col. 3, lines 17-26), whereby natural gas inherently contains propane.

Regarding claim 22, Froberg teaches processing pressures within the range of

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50-760 torr (col. 3, lines 9-16).

For claims 10 and 20, Froberg discloses a reactant gas mixture comprising acetylene, natural gas, methane, etc (col. 3, lines 17-26). Natural gas is a mixture of gaseous hydrocarbons with methane as the chief component while the balance is composed of varying amounts of ethane, propane, butane, and other hydrocarbon compounds. Therefore, propane is necessarily present in the mixture. Choosing specific percentages of methane and propane as per claims 10 and 20 would have been within the level of ordinary skill in the art at the time of the invention.

As per claim 26, Froberg teaches a method for vapor depositing pyrolytic carbon on porous sheets of carbon material. Specifically, an elongated continuous porous sheet of fibrous carbon (i.e. porous material) is longitudinally traversed through a reduced pressure heating zone (i.e. continuously loading the porous material into a CVI chamber) while introducing a reactant gas onto the heated sheet (see abstract). The sheet moved through guide slot 38 with polycrystalline graphite plates 36 and 40 located above and below the guide slot, whereby the plates are capable of acting as an electrical resistance element for heating slot 38 (see fig. 1; col. 4, lines 1-10). Froberg does not expressly teach placing the material into a module or loading the module into said CVI chamber. It is very well known in the CVI art to place porous material into modules for densification processes (for example, see [0090], [0092], and figs. 17 and 18 of Purdy as evidence).

For claims 27 and 28, Froberg teaches heater plates above and below said module/porous material (col. 4, lines 1-10).

For claim 29, Froberg does not explicitly disclose a reverse gas flow process. However, once the reactant gas is introduced into the chamber, the gas will interact with the heating plates and have the same effect as the “reverse flow rate” of the instant application (col. 4, lines 1-10).

As per claim 44, Froberg teaches a sheet is moved through guide slot 38 with polycrystalline graphite plates 36 and 40 located above and below the guide slot, whereby the plates are capable of acting as an electrical resistance element for heating slot 38 (see fig. 1; col. 4, lines 1-10). Froberg does not expressly disclose the dimensions for the heat plates; however, it would have been within the level of ordinary skill in the art at the time of the invention to optimize the shape of the heater plates in order to minimize the cooling effect of the incoming gas and to provide uniform heating of the substrate with the reasonable expectation of success.

7. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Froberg (3,944,686), Purdy et al. (2001/0019752) and Golecki et al. (US 5,348,774) as applied to claim 11 above, in view of Sekiya et al. (JP 408002976A).

As per claim 21, Froberg does not expressly teach a temperature in the range of 1700-2500°F.

Sekiya teaches a method for producing a carbon fiber/carbon based matrix composite material prepared from carbon fibers according to a chemical vapor infiltration method (CVI method) whereby the temperature is regulated at 1200-1300°C, which is within the claimed range (see abstract). Therefore, one having ordinary skill in



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the art at the time of the invention would have utilized the temperature range as taught by Sekiya in Froberg's CVI method in order to densify a porous material at lower temperatures, thus saving energy and decreasing the cost of processing in Froberg's method with the reasonable expectation of success.

8. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Froberg (3,944,686), Purdy et al. (2001/0019752), and Golecki et al. (US 5,348,774) as applied to claim 45, and further in view of Fisher et al. (US 6,083,560).

Froberg/Purdy/Golecki does not expressly state that the heater plate has varying thicknesses. However, it is well known in the art to optimize the temperature in CVI processes in order to obtain the desired deposition rate (see Fisher at col. 14, lines 20-28). Therefore, it would have been obvious to one skilled in the art at the time of the invention to vary the thickness/size of the heater plates in order to attain the optimum temperature for a desired deposition rate.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Francis P. Smith whose telephone number is (571) 270-3717. The examiner can normally be reached on Monday through Thursday 7:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on (571) 272-1303. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/F. P. S./

Examiner, Art Unit 1792

/Michael Kornakov/

Supervisory Patent Examiner, Art Unit 1792